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## SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports\*  
for  
SOIL CONSERVATION SERVICE RESEARCH\*\*

MAY 1949

EROSION CONTROL PRACTICES DIVISION

Report of Dust Bowl Conditions - May 31, 1949 - H. H. Finnell, Goodwell, Oklahoma.-"As we come to the final report of dust conditions for the 1948-49 blow season there are some indications that the center of interest may be in the process of switching from the sandy rowcrop lands of the west Texas- east New Mexico area to the marginal wheatland areas centering in southeastern Colorado. Current rainfall has favored the southern plains for several weeks running, while wheat crop conditions have been steadily deteriorating, accompanied by increasing abandonment in the Colorado area.

"Based on my most recent personal observation in both these territories, I think we have plenty of reason to urge a high degree of alertness in both places, with a view to preserving a dwindling ground cover on one hand and on the other to taking advantage of all favorable opportunities to regain ground cover where it has been lost.

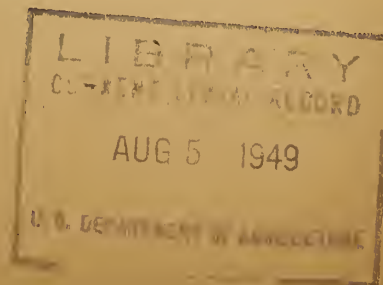
"One favorable item in view at this moment is a definite trend toward increasing the sorghum acreage in the Clovis territory of eastern New Mexico to cover land where wheat has failed."

Kudzu Unhealthy on Soil with Very Low pH Values - R. M. Smith, Puerto Rico.-"A few pH tests of red clay subsoil supporting kudzu at Mayaguez show that there is an association between acidity and the yellow, small-leaved, reddish-veined condition noted on a part of the area. Seven soil samples from green, vigorous kudzu patches showed pH values between 5.8 and 7.5, whereas 8 samples collected in the unhealthy kudzu varied from 4.3 to 5.0. All of the soil tested was fertilized with phosphate, and a part of it was limed last year. The symptoms associated with the acid, unlimed subsoil are considered acceptable evidence that extremes of acidity should be corrected before seeding kudzu on this kind of soil."

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\*\* All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.



Chemical Weed Control Versus Cultivation in Relation to Soil and Water Loss - O. R. Neal, New Brunswick, New Jersey.-"An exploratory study on cultivation as compared with chemical weed control and no cultivation was conducted during the 1948 year. Field corn was grown under the two cultural methods. There was a tendency for water and soil losses to be higher from the uncultivated area during the period of regular cultivation. This tendency was reversed after cultivation stopped. It appears that structural conditions of the soil, after cultivation stopped, were poorer as a result of the repeated cultivations during the early part of the growing season.

"Soil moisture tension was higher under the uncultivated condition during the early part of the season as would be expected from the runoff results. Moisture conditions were not significantly different under the two practices during the latter part of the growing season. The corn yield was 81 bushels per acre under cultivation and 58 bushels under the chemical weed control without cultivation."

Influence of Mulch on Soil Aggregates - "Aggregate analyses of soil samples by the pipette method and by wet sieving indicate that while the former method gives better reproducibility between duplicates, yet much information not available from the pipette method is gained from the wet sieve analyses. This is shown in the following sample data from a mulching experiment on the Vegetable Research Farm.

	Pipette Method	Wet Sieve Method			
	Degree Aggregation	Degree Aggregation	Aggregation Distribution		
			1 mm.	.5 mm.	.25 mm.
Surface mulched	68.5	49.7	45.9	25.5	28.6
	69.1	39.5	38.2	25.3	36.5
Surface not mulched	63.8	42.2	25.4	28.9	45.7
	61.9	41.3	21.5	30.7	47.7

"Since both methods employ arbitrary sample treatment, results of the two methods are not expected to coincide. The points to be noted here are that (1) aggregation is greater under mulched plots, and (2) the aggregates that are present under non-mulched plots are smaller in size than those under mulched plots. This latter information is significant in soil structure studies and is obtainable only by wet sieving.

"Apparatus for wet sieving aggregates has been motorized so that greater numbers of samples can be run. Progress is also being made in construction of natural structure sampling apparatus and of an air space pycnometer."



Work Unit Technician Reports on Erosion-Control Practices on Tobacco Land - T. L. Copley, Raleigh, N. C.-"Mr. John L. Harrison, Work Unit Conservationist, Rustburg, Virginia, wrote us a very interesting report on his work with our String Method of tobacco row layout on tobacco farms in Campbell County, Virginia. Such reports are highly encouraging, and seem to indicate that our efforts in working out the row system have been well worthwhile.

"Mr. Harrison wrote: 'For some time I have wanted to write and thank you for your cooperation in sending the No. 329 Bulletins. We found them to be very practical and helpful to both us and the farmers. We ran into a bad week, from a weather standpoint, but have been busy doing row layout on individual farms ever since. I am glad to report that we now have the largest acreage of tobacco land properly laid out that we have ever had before. I am well pleased with the progress this year. We have found the system to be most helpful in preventing erosion, in properly distributing water, and in preventing drowning. The farmers who have the system swear by it, and say they will never use anything else.

We have an old negro, George Peerman, of Gladys section, who never misses a chance to tell how much it helped him. George did have a bad situation, before we started, with his rows up and down hill. At the upper end his tobacco was small, because of no water, and at the lower end, too large and drowning because of excess water. In the spring of 1948 we designed the complete water disposal system and he did a very good job in getting things done correctly. In spite of the dry weather in the section he had a beautifully uniform crop of tobacco. George says he produced 500 pounds of tobacco more per acre last year than he had ever produced before. This brought \$175.00 more per acre on five acres--enough to pay all his debts. He told a group on his farm that the system did him more good in one year than all other programs had ever done. He is your friend and mine, and is doing more to speed the system than any other farmer in the county. I am going to write the story up in the proper form and shall be glad to send it to you'."

Stubble-Mulch Land Favored Establishment of Brome - F. L. Duley, Lincoln, Nebraska.-"Brome seeded last fall on plowed land did not give as good stand as where seeded on stubble-mulch wheat land. Erosion during winter and spring was much worse on the plowed land. This protection of soil by stubble mulching while starting grasses or legumes is one of the very important advantages of the system.

Good Volunteer Stands of Legumes in Oats Following Corn which Followed the Legumes - "Legumes seeded this spring in small grain are making excellent growth and good stands have been obtained. Excellent volunteer stands of annual and biennial sweetclover and partridge peas have been obtained in oats after the land had been in corn a year following the legume. This method of maintaining the nitrogen supply under a system of stubble-mulch farming seems to offer distinct possibilities for improving our soils while we are using the residue for control of erosion."

New Developments of Pitting Equipment For Use on Pasture Land -

Joel E. Fletcher, Tucson, Arizona.--"Two new developments have appeared in the line of devices to make pits preparatory to range reseeding. The first is the modification of the Crause plow to making pits. This is done by cutting a standard disk along a chord 2 inches in from the rim. The pit made by this disk differs from that made by the eccentric disk in that they have nearly vertical excavation at each end. They are also somewhat narrower.

"The second development is the crossing of this disk with the eccentric disk to give an eccentric cutaway disk. A much larger pit may be made with this tool than any other method yet devised. Preliminary tests indicate that this will prove to be superior to any other method for holding rain where it falls than any other yet devised."

Crop Rotation in Relation to Soil and Water Conservation and Crop Yield - Harley A. Daniel, Guthrie, Oklahoma.--"A rotation of cotton, wheat and sweet clover has been studied on the Red Plains Station during the last 19 years. It has reduced soil losses 77 percent and runoff 35 percent annually as compared to continuous cotton. Both the wheat and sweet clover greatly reduced erosion but the amount of soil removed from the wheat plot was 6.4 times more than that from sweetclover. The yield of cotton in the rotation during the first 10-year period was less than that on the continuous area. But, during the third 5-year period it was 58.5 percent higher and in 1945-48 it increased an average of 205.5 percent.

Revegetation of Eroded Land and Its Use For Beef Production - "Grass re-establishes itself slowly under natural conditions on eroded land, but the process can be greatly speeded up by working with nature. In regrassing exposed subsoil and unweathered parent material the problems common to this type of land must be overcome.

"Low fertility can be corrected by the addition of commercial fertilizers and lime. The organic matter supply in the soil is built up and available nitrogen is increased by growing sweetclover and other legumes. Soil organisms can then thrive. Their activity improves the physical condition of the soil, which is extremely important in obtaining good seeding of native grass. Sweet clover in 1948 on eroded land produced 4,520 pounds of forage and 234 pounds of seed per acre at Guthrie. During the spring growing season it produced 44 pounds of beef per acre. Vetch is also being used to improve soils for grass culture. After legumes are established, grasses may be introduced by the seed-hay method.

"Beef Production. This system of regrassing, fertilizing and management of formerly unused land paves the way to permanent and stable pasture and livestock production on this type of land. Sound development and use of such land controls erosion and provides an opportunity for greater production. Through this type of conservation much of the shallow, eroded land can be converted into profitable pasture and meadow and satisfactory returns obtained (Table 1).



Table 1.--Beef production on shallow, eroded, regrassed soil, Guthrie, Oklahoma

Year	Pounds of Beef Per Acre	
	Unfertilized	Fertilized <sup>1/</sup>
1944	41	
1945	37	
1946	41	
1947	36	86
1948	53	98
Average	41	92

<sup>1/</sup> Beginning in the spring of 1947 this area was fertilized with 300 pounds P/A of superphosphate and 100 pounds P/A of ammonium nitrate. The superphosphate will be applied every third year and the ammonium nitrate annually.

"During the past five years of summer grazing, yearling steers on severely eroded unfertilized land produced an average of 41 pounds of beef per acre. But beef gains on regrassed, eroded land can be increased by fertilization. When phosphorus and nitrogen fertilizers were applied to regrassed land in the spring of the last two seasons, beef production the following summers was increased about two and one-fourth times."

Kudzu-Based Pastures - E. H. Hendrickson, Watkinsville, Georgia.-  
 "Winter annuals which provided valuable winter grazing in kudzu pastures set heavy seed crops during May while pastures were closed. Kudzu, growing from old established crowns, is fast forming a canopy over heavy mats of this reseeding 'plant manure', which as it decays, is contributing in large measure toward improving the Class IV land. The winter annuals that appear to fit these particular conditions best are oats, ryegrass, rescue grass, smooth vetch and Caley peas. Oats volunteers to some extent. The others thicken their stands in this succession."

Soil Moisture and Related Problems in Cherry Orchards - Harold W. Black, Benton Harbor, Michigan.-"Cherry orchards under a variety of sod, cultivation, and mulch practices in the Traverse City area were inspected on April 6th and 7th with Dr. Kenworthy. A large number of cherry orchards in this area are being put under permanent grass covers, principally chewings fescue, and a number of important soil moisture and plant nutrient problems are developing. It is desirable that soil moisture studies be extended to this area."

Additional Fertilizer Required for Good Hay Yields in Third and Fourth Year Meadow - Dwight D. Smith, Columbia, Missouri.-"All series II meadow plots have made an excellent growth and were ready to mow for hay May 31. This year for the first time 3rd and 4th year meadows in the 6-year rotations are equal or superior to the 1st and 2nd year meadows. These older meadow plots have a growth of timothy and red clover that should yield close to two tons hay per acre. They received applications of 200 pounds/acre of 10-20-20 fertilizer immediately following the second hay crop of their second hay year, plus an additional 100 pounds/acre in the spring of 1947. This corroborates the information secured from the fertilized grass and legume pasture areas that continued high production of forage can be secured on these low phosphate level soils by refertilization every other year with readily available phosphate. This frequency of application is apparently necessary when using superphosphate as extremely high applications on terrace outlets and other meadow areas on the station have not been effective beyond the second year.

"Phosphate deficiency is apparent this month on 2nd year clover (red and Ladino) of Field 1. The field tested 25 pounds and received 108 pounds of soluble  $P_2O_5$  in the fall of 1946. Twenty-one bushels of rye were harvested in 1947 and 2.9 tons of hay in 1948. This spring the soil tested 29 pounds of  $P_2O_5$ . To produce vigorous, high-yielding meadows and pastures on this soil naturally low in phosphate requires regular additions of soluble phosphorus. If the phosphate content is brought up to sufficiency level (200 pounds per acre) with raw rock phosphate, much smaller additions of soluble phosphorus are required."

Depth of Flowing and Sorghum Spacing in Relation to Wind Erosion - H. G. Porterfield, Brownfield, Texas.-"Weather conditions have been extremely unfavorable for crop establishment during this month. Eight periods of moisture occurred with a total precipitation of 4.00. The average for May is 2.59. These eight rains, divided fairly evenly during the complete month, agitated the wind erosion problem, as they left the soil 'smoothed off' with sand on the surface. A large amount of emergency tillage has been necessary to control wind erosion.

"Thirteen periods of wind occurred which caused erosion on some areas. Of these storms, four were classed as severe, four as moderate, and five as light. Two of the severe storms did a large amount of damage in the general area. A field on the south of the station blew severely during the month, and the sand crossed the state highway and blew onto the station plots for about a hundred yards. This will probably give us an added wind erosion problem during this crop season.

"The land deep broke in 1948 (12 inches deep) with the regular farm tractor with some clay on the surface has resisted wind erosion much better than the listed plots that have never been deep broke. The land plowed in April twenty inches deep to bring clay to the surface has had no wind erosion. This plowing cost \$10. per acre and was done by a plowing contractor with the largest caterpillar tractor manufactured and a five-disc plow. Also, land deep broke in April 12 inches deep with a farm tractor has had no soil blowing. However, much less clay was obtained on the surface than with the twenty inch breaking. In some deep sandy spots the 12 inch breaking did not reach the clay.



"The sub-surface tillage plots with forty inch sorghum stubble suffered severe erosion. The twenty inch spaced sorghum plots have remained very stable except in thin stand spots."

Costs and Extra Income from Soil Conservation - E. L. Sauer, Urbana, Illinois.--"Three eye-opening facts stand out from a study comparing 124 farms on slow-draining land in LaSalle, Will, Livingston, Ford, Vermilion and Iroquois counties. The farms were alike in every way except half of them followed recommended conservation practices and the other half didn't.

1. The complete cost of setting up a conservation program averaged \$34.12 an acre. This total includes extra buildings, equipment, machinery, and livestock costing \$11.36 an acre which were needed to put the conservation plan into operation.

2. For 1945-46-47, 40 high-conservation farms earned an average of \$10.63 more per acre than 40 physically comparable low-conservation farms. All farms practiced conservation, but high-conservation farms had a more complete farm plan.

3. This \$10.63 an acre income advantage would have paid the complete costs of the conservation program in less than three and one-half years.

"There's no question about the long-time benefits of conservation. For 10 years 20 McLean county farms having conservation plans were compared with neighboring farms of similar physical resources. The records show that conservation increases crop yields, helps produce more livestock, and boosts net farm incomes. For the 10-year period, net farm incomes averaged \$3.46 more per acre on conservation farms. That's after paying for all expenses, including conservation costs. That \$3.46 per acre bonus would amount to \$5,530 more income on a 160-acre farm for the 10 years.

"Contour farming increases crop yields, reduces soil and water losses through surface run off, and on the average does not increase total farm operating costs. For a 7-year period, the corn yield was 12 percent larger, soybeans 13 percent more, oats 16 percent, and wheat 17 percent larger when these crops were grown on the contour compared to old-fashioned up-and-down-the-hill system on the same farms.

"Labor, power, and machinery costs averaged \$1.20 an acre less on 135 contour-tilled farms compared with 135 farms of similar size and type which were not contour-farmed.

"Livestock farms following a good conservation program produce more meat per \$100 of feed fed. The larger yields and better quality of hay and pasture, plus better quality grain on conservation farms, explains their greater livestock efficiency.

"Can we afford not to farm the conservation way?"

Nitrate Release During Decomposition of Alfalfa-Bromegrass -  
 Roy C. Dawson, College Park, Md.--"The following data are summarized from results obtained during the summer and early fall of 1948 from plots maintained by the Soil Conservation Service, Division of Research, at Beltsville, Maryland. The data were obtained from samples taken from the ridges of ridge rows during the months of June, July, August, September and October. Alfalfa bromegrass was turned under on all plots. Two dates of turning were studied. Early and late turning were accomplished by plowing April 12 and May 27, respectively. The alfalfa-bromegrass residues were used alone, with added wheat straw and with added ammonium sulphate. All treatments were maintained in duplicate and on plots with and without a tobacco crop. Tobacco was transplanted in plots growing a crop on June 25 and was harvested on September 8.

"A significant decrease in the mean nitrate nitrogen content of plots receiving wheat straw is shown in table 1. The results shown were obtained from the second foot of soil where, in general, trends for the 5-foot profile were reflected. Although the nitrates were considerably lower in plots growing tobacco than in fallow plots, the effects of residue amendments were similar in both instances. The lowest nitrate concentrations were found in the presence of added wheat straw while the highest concentrations resulted where ammonium sulphate was added. These results show that the amount of nitrogen available as nitrates during the decomposition of an alfalfa-bromegrass mixture can be influenced significantly by the addition of a highly carbonaceous residue on the one hand or a readily nitrifiable material on the other.

Table 1.--Nitrate nitrogen content (ppm) of second foot of alfalfa-bromegrass plots alone and with wheat straw or ammonium sulphate.

Alfalfa-bromegrass			Level of Significance
Straw	Alone	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	
Without Tobacco Crop			
4.84	6.59	6.92	5% or 19:1
With Tobacco Crop			
1.84	2.25	4.05	1% or 99:1

"Differences in nitrate nitrogen content of the second foot of soil on the different dates of sampling were highly significant in plots with and without growing tobacco plants (table 2). In plots without tobacco the nitrates increased from 2.91 ppm in June to 3.59 ppm in July and 10.80 ppm in August at which time the maximum was reached. A slight decrease then followed during the next two months. In plots growing tobacco, which was transplanted June 24, the mean nitrate content for the June sampling, which was made before transplanting, was 3.53 ppm. A slight increase to 4.26 ppm followed in July giving a somewhat greater concentration of nitrates than the plots without tobacco. This indicates that the young plants had not begun to draw appreciably upon the nitrates of the second foot of soil about two weeks after transplanting. At the time of the August sampling, which was about six weeks after transplanting, the nitrate nitrogen content decreased to 3.03 ppm while similar fallow plots contained 10.80 ppm. In September the plots growing tobacco continued to decrease in nitrate nitrogen content to 0.90 ppm. In October, about a month after harvesting the tobacco, there was a slight increase to 1.85 ppm nitrate nitrogen.



Table 2.--Nitrate nitrogen content (ppm) of second foot of alfalfa-bromegrass plots at different dates of sampling.

June	Date of Sampling				Level of Significance
	July	Aug.	Sept.	Oct.	
2.91	Without Tobacco Crop				1% or 99:1
	3.59	10.80	7.18	6.10	
3.53	With Tobacco Crop				1% or 99:1
	4.26	3.03	0.90	1.85	

Yields of Cover Crops in Relation to Planting Dates - C. J.

Whitfield, Amarillo, Texas.--"Yields were taken on the legume planting in sorghum stubble land on May 26. At this time, both the Austrian Winter Peas and the Hairy vetch were in full bloom. Immediately after the yields were taken, the plots were plowed in preparation for planting sorghum this spring. Periodic checks on nitrates will be made on these plots during the season. Plantings were made in October and November of 1948. The October plantings made fairly good yields but the later planting in November made very poor yields.

"The following table gives both the green weight and dry weight of forage for both planting dates:

Date of Planting	Austrian Winter Peas		Hairy Vetch	
	Green Wt. Tons/Ac.	Dry Weight Tons/Acre	Green Wt. Tons/Ac.	Dry Wt. Tons/Ac.
October 15, 1948	6.49	1.24	5.23	1.15
November 15, 1948	.44	.13	.16	.08

Stubble Mulch in Relation to Forage Production - "Wheat forage samples taken on the stubble mulch plots on April 25, 1949 were analyzed for protein content and, in the case of the continuous wheat plots, showed considerable differences in the amount of nitrogen which had been absorbed by the crop. The largest amount of nitrogen was in the wheat growing on the moldboard plow plots and the lease amount in wheat from the subtilld stubble mulch plots. The small amount of nitrogen in wheat on the subtilld plots was due, not only to low protein content, but also to a low yield of air dry forage. There was no striking difference in the amount of nitrogen in wheat growing under a fallow system with the subtillage sweep and oneway plow as the tillage implements. The larger weight of forage in the case of the subtilld plots was offset by lower protein content.

"The wheat on the delayed fallow stubble mulch plots, in which cultivation was not commenced until approximately April 1 of the fallow season, was slightly higher in pounds nitrogen per acre than that on the conventional subtilld fallow plots. This was due to a larger amount of forage.



Table 1.--Dry weight and nitrogen content of forage from wheat growing on stubble mulch plots on April 25, 1949

Tillage	Dry weight forage Lbs. per acre	Per Cent Protein	Nitrogen Lbs. per acre
	<u>Continuous Wheat</u>		
Oneway	1217	15.8	31
Moldboard plow	1674	15.4	41
Stubble mulch	1070	12.9	22
	<u>Wheat on fallow</u>		
Oneway	2744	16.5	73
Delayed stubble mulch	3528	12.7	72
Stubble mulch	3222	13.4	69

"The Dempster Manufacturing Company has placed a sweep machine on the station for trial on stubble mulch tillage. The machine has the same features as the one built on the station with power lift, rolling coulters, and five 30" sweeps. The machine seems to be working very well under present conditions but will need further testing on dry hard soil to determine whether the machine will do the job under adverse conditions."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. Schiff, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Precipitation of 2.86 inches was distributed over 13 days of the month. The largest amount on any one day was 1.22 inches. Resulting surface runoff was small.

"Mr. Dreibelbis reports that a 10-year rotation plan was started for our black locust plantations which were planted in 1938. Under this plan 1/4 acre will be clear cut each year for 10 years. On the 11th year the first area cut will be re-cut. Reproduction will be obtained by sprout growth from the stumps. Also, work was continued with different soil moisture units and use made of mercury manometers in the field in conjunction with soil moisture units for information primarily in the wet range. Work has been started with Mr. Schiff to make simple recorders to be used with the mercury manometer tubes to automatically record soil moisture changes.

"Mr. Schiff reports that infiltration curves are being prepared for different crops and soils. It is planned to correlate these curves with soil moisture. A paper entitled 'Surface Runoff Supply Estimates Based on Soil-Water Movements and Precipitation Patterns' is nearing completion. The method presented involves the following concepts: (1) transmission rates of specific magnitudes may be applied to soils of reasonably similar hydrologic characteristics; (2) transmission rates may be converted into corresponding infiltration rates; (3) an 'in place' supply of water to the soil surface is estimated. This 'in place' supply may be translated into the hydrograph of stream flow for a given sub-basin through an evaluation of surface detention and channel storage. The hydrographs for the sub-basins may be combined for the entire basin. Estimates of the actual flow at any point must consider subsurface flow when such flow is appreciable."

Hydrologic Studies - R. W. Baird, Waco, Texas.-"During the month of May precipitation totaled 1.14 inches at station 69, compared to a normal of 4.56 inches. Only one storm of any appreciable magnitude occurred, this being the storm of May 19, with 0.73 inch of rainfall. There was no field runoff from any area from this storm.

"Table 1, which appears on the next page, shows the monthly rainfall and runoff for the period January through April 1949, for a number of the runoff stations. The areas W-1 and W-2 have been farmed in the ordinary manner with straight rows and no special attention given to conservation practices. The other seven areas listed are areas where a complete conservation plan has been followed. On these areas the conservation plan includes retirement of some land from cultivation to permanent grass, the use of improved crop rotation on all cultivated areas, and terraces on all sloping cultivated land.

"It will be noted that for the 4-month period the net amount of water retained was less on the areas W-1 and W-2 than on any of the areas with conservation practices except area Y-10. Because of rainfall differences, area Y-10 had 0.21 inch less rainfall than area W-2 and 0.33 inch less rainfall than area W-1. The reduction in runoff losses this season have not been very great, but may be sufficient to account for some crop-yield differences which will show up in later reports.

Table 1. Monthly rainfall and runoff--January through April 1949

Month	Station Area	W-1 176.	W-2 130.	Y 309.	Y-2 132.	Y-4 79.9	Y-6 20.9	Y-7 40.0	Y-8 20.8	Y-10 21.0
January	Rainfall	4.075	4.117	4.119	4.117	4.140	4.121	4.306	4.120	4.156
	Runoff	0.	.0032	.0002	0.	0.	0.	0.	0.	0.
February	Difference	4.0750	4.1138	4.1188	4.1170	4.1400	4.1210	4.3060	4.1200	4.1560
	Rainfall	1.526	1.665	1.575	1.594	1.613	1.524	1.503	1.520	1.666
March	Runoff	.0006	.0073	.0001	0.	0.	0.	0.	0.	0.
	Difference	1.5254	1.6577	1.5749	1.5940	1.6130	1.5240	1.5030	1.5200	1.6660
April	Rainfall	2.945	3.052	2.851	2.787	2.725	2.957	3.024	2.970	2.584
	Runoff	.2646	.3037	.0940	.0516	.0441	.0491	.1715	.0591	.0891
April	Difference	2.6804	2.7843	2.7570	2.7354	2.6809	2.9079	2.8525	2.9109	2.4949
	Rainfall	4.237	3.832	4.096	4.107	4.109	4.224	4.334	4.230	4.046
Four-month Total	Runoff	.3986	.2872	.2315	.2057	.2545	.3365	.2196	.1384	.3343
	Difference	3.8384	3.5448	3.8645	3.9013	3.8545	3.8875	4.1144	4.0916	3.7117
Four-month Total	Rainfall	12.783	12.666	12.641	12.605	12.587	12.826	13.167	12.840	12.452
	Runoff	.6638	.6014	.3258	.2573	.2986	.3856	.3911	.1975	.4234
Four-month Total	Difference	12.1192	12.0646	12.3152	12.3477	12.2884	12.4404	12.7759	12.6425	12.0286



"Soil moisture on corn areas is being depleted rapidly and, unless rains occur by the middle of June, a light yield of corn is expected. Oats have had sufficient moisture to make a normal crop. Cottonland has ample moisture at the present time, and is in good growing condition.

"On May 18, the percent of moisture at a depth of 60 inches on oat, corn, and cotton areas in the Y area, where conservation measures have been applied, was as follows: oats, 25.3; corn, 26.0; and cotton, 30.1. On the same date, the percent of moisture on the same crops in the W area, where conservation measures have not been applied, was as follows: oats, 23.2; corn, 29.0; and cotton, 29.3. It may be noted that there is very little difference in moisture conditions for the same crops in the two areas. The rains this season have not produced enough runoff from either area to show any appreciable differences in moisture. The oat crop has left the two areas with approximately the same percentage of moisture. The oats have been harvested, and differences in yield will reflect the soil fertility conditions of the two areas rather than moisture conservation during the current crop year. The oats have not yet been threshed.

"It has been necessary to poison grasshoppers along roadsides and pasture border areas. Thrips are doing considerable damage to cotton, with approximately 75 percent of the cotton plants showing thrip damage. Control measures are being applied to some areas. Adult cotton flea hoppers are beginning to appear in cotton fields."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"In May we received 6.84 inches of precipitation at the meteorological station, which is the highest May precipitation we have had during the 11 years of record at this station. This is practically double the average long-time average rainfall for the month. All the rain fell in the first 23 days with the highest storm of about 2.0 inches on May 6. Other storms of about an inch each were recorded on May 1, 8, 19, and 21.

"Runoff was measured at practically all the stations during the above storms, but was not especially high, except on watershed W-8 containing 2,086 acres, where the flow was slightly higher than the previous peak of 398 c.t.s., on August 25, 1944.

"Most of the waterways on watershed W-5 were seeded to grass the early part of May. The rains that fell later washed rills on the steeper slopes and in several instances it was necessary to sow oats where the grass had washed out. Practically 100 percent of the corn in the watershed was planted on the contour."

Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan.-"Precipitation for the month of May, as measured by the U. S. W. B. type of non-recording rain gage, amounted to 2.67 inches at the cultivated watershed, 2.16 inches at the wooded watershed, and 2.44 inches at the stubble-mulch plots. These amounts were approximately 78 percent, 63 percent, and 71 percent of the 3.42-inch normal May rainfall at East Lansing. Precipitation for the month of May, at the cultivated watersheds, can be expected to equal or exceed 2.67 inches once in 1.45 years, according to the frequency curves prepared from the 1864-1947 precipitation records. Cumulative rainfall for the year at the cultivated watersheds is approximately 105 percent of normal.

"There was runoff during the month from watershed B, which is now planted to oats. This runoff occurred May 19 and resulted in 0.1929 inch of runoff. It was not accompanied by soil loss."

Hydrologic Studies - E. H. Kidder, Auburn, Alabama.-"The rainfall for the month was as follows: May 1, 0.60; 8, 0.07; 18, 0.03; 20, 0.08; 23, 0.07; 29, 0.57; and 30, 1.01; totaling 2.43 inches. The distribution of the rainfall is of significance in that prolonged dry periods like the one that occurred between May 1 and May 29 seriously retards pasture and vegetable crop growth. Supplemental irrigation is needed during these periods to maintain optimum growth conditions.

"The monthly rainfall is 68 percent of the 68-year average of 3.57 inches for May. The 68-year average monthly distribution of precipitation is as follows: January, 4.93; February 5.52; March 6.23; April 4.40; May 3.57; June 4.09; July 5.48; August 4.76; September 3.24; October 2.67; November 3.45; and December 5.06; totaling 53.40.

"The precipitation for May is the lowest of the first 8 months of the year. While it is true that a measure of dry weather can be helpful to new plantings in encouraging the development of a good root system, a period of dry weather such as occurred during this month can be harmful to established shallow rooted crops that have a relatively high water requirement."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.-"Mr. Kirkpatrick and Mr. Holtan spent a considerable portion of the month in working on the Chatham watershed data. They report the following progress:

"During the month additional hydrographs were analyzed to strengthen the relationship between rate of runoff and detention in hopes of obtaining a basis for estimating a size factor for the watersheds located at Chatham.

"An additional approach to a size factor was inaugurated using mass frequency curves of runoff. This is being done under the premise that mass runoff is influenced by retention only and that rate of runoff is influenced by retention and size. It is intended to develop a retention factor from mass runoff and apply it to the rate of runoff. The residual in rate of runoff will be a size factor which will be checked versus that based on relative positions of the depth discharge relationship. The data are in the form of pen traces and has to be tabulated and calculated before this analysis can be completed."

Farm Ponds - T. W. Edminster, Blacksburg, Virginia.-"Mr. Holtan reports the following with regard to farm pond studies:

"Sedimentation curves were completed for two soils; i. e., curves were obtained of soil aggregated, dispersed and after treatment with bentonite. As earlier reported, the same sample was used for aggregated and, after drying, for bentonite treatment. The bentonite was mixed with the soil with enough water to give a pasty condition to the mass.

"Results of these runs gave curves of bentonite treated soil almost identical with the dispersed curve. This is in refutation of the curves obtained earlier wherein the aggregated curve was the lower curve and was concave upward, the bentonite curve was in the middle and a straight line and the dispersed curve was at the top and concave downward. The relative position of these curves indicates the percent of soil in suspension at any given time.

"Subsequent testing revealed that the dispersion of the aggregated soil in the application of bentonite was also obtained by working the soil untreated while in a pasty condition.



"The earlier curves of three degrees of concavity were obtained using different samples for each curve. The bentonite treated samples were air dried from the same samples treated for permeability tests. The fact that the curves were not obtained from the identical same sample with varied treatment nullified quantitative type of analysis; therefore, the present method was initiated. However, it appears at this writing that some type of analysis will have to be designed to utilize the original test data. Trends and characteristics can at least be studied.

"A visit to the Leetown Fish Hatchery, Kearneysville, West Virginia, during the period proved very interesting. Seven ponds had been built on marl deposits and were leaking profusely. Bentonite had been tried in one pond and a clay blanket in another. The result was a perfect demonstration of the lubricating effect of these materials in the pond bottom. The already structurally weak marl profile melted into a fluid mass which blew holes and flowed out as a thick fluid. This occurred under only 2 or 3 feet of head of water. It was also an excellent substantiation of the earlier adverse report on the prospective pond on the 112-foot deposits of marl anticipated by the BARC at Covington, Va., early in 1947.

"A recommendation was made to the Hatchery to use a sandy loam in a cut-off core wall in the pond boundaries keying it into an existing deep layer of clay. A report was submitted to the Hatchery separately on this recommendation."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Edwardsville, Ill., was 6.24 inches, and runoff 1.60 inches. More than two-thirds of this rainfall, and nearly all of the runoff for the month occurred in two storms on May 9 and 21. The storm of May 9 gave the highest rates of runoff, and data for this storm are given in the following table. Temperatures varied from a maximum of 90 degrees on the 6th to a minimum of 35 degrees on the 11th, with a mean of 64 degrees, which is normal.

Watershed	Drainage area, acres	Total rainfall	Maximum intensities for selected time intervals, inches per hour				Maximum rate of runoff
			5 min	10 min	15 min	20 min	
W-1	28	1.73	6.00	5.70	4.60	4.26	1.44
W-2	50	1.40	5.40	4.20	3.84	3.30	1.49
W-4	289	1.34	4.80	4.08	3.60	3.22	.75

"Precipitation at Fennimore, Wis., for the month was 2.26 inches, and there was no surface runoff. Temperatures varied from a maximum of 88 degrees on the 5th, to a minimum of 36 degrees on the 10th, with a mean of 60 degrees, which is near normal. The runoff stations were checked, and necessary adjustments made on May 23 and 24.

"A standard rain gage was established near Colby, Wis., and the observer was instructed in methods of collecting rainfall data with this gage, and also taking soil moisture samples. Soil moisture samples were collected on April 21, May 13, and May 26. These samples showed a moisture content of 30 percent, or near field capacity, on the first date shown above. This was somewhat lower on May 13, and only 20 percent on May 26. The available moisture was being rapidly depleted at the end of the month, and pasture, hay, and small grains were making poor growth, due to the about one-half normal rainfall."



Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.--"Model tests on box inlet drop spillway detention storage structure P-2 were made early in the month to determine the capacity of this structure, to develop rating curves and to discover the effect of submergence for the design flow. These tests were made for two different headwall openings since the originally proposed opening proved to be too small to pass the design discharge with the assumed headwater and tailwater levels. The tests were routine in nature.

"Early in the month Mr. Blaisdell prepared the hydraulic design for an outlet structure for three 48-inch pipe drop inlet spillways on F ditch. No tests were run on this outlet since its design was based on laboratory tests made by us and others on the component parts. The outlet consists of a transition from circular to rectangular, a diverging transition to spread the water--this transition ending in a parabolic floor curve and short diverging chute--and a SAF stilling basin with diverging sidewalls.

"Mr. Donnelly completed the tests of ditch outlet structure C-5 on May 31. The discharge in this ditch amounts to 595 cfs and flows at a velocity of 40 fps in a trapezoidal channel 7 feet wide with 1 on 1.5 side slopes. A transition to a horizontal rectangular channel 12 feet wide was developed. This channel is carried on piles and is cantilevered 15 feet beyond the last pile bent. A baffle 40 feet upstream from the end of the channel prevents the high velocity flow from shooting through to the end of the structure. A U-type horizontal end weir 3 feet 10 inches high by 12 feet wide by 15 feet long distributes the flow at the end of the channel.

"It was necessary to cover the channel to prevent overtopping of the sidewalls and reduce the sidewall height to reasonable limits. This cover should also have considerable structural advantage. Considerable depth of scour can be anticipated at the end of the structure and undermining of the outlet for 40 feet is probable. This particular design was developed so that construction could be completed without the deep excavation in water-bearing sand which would otherwise have been required. A word of caution should be voiced here. This type of outlet is far from foolproof and should not be considered by anyone who is not thoroughly familiar with what may be expected in the nature of deep scour, undermining of the channel, and strong and erosive side whirls which may destroy the banks of the stream.

"A moving picture film about 750 feet long was completed at the end of the month. This film shows some of the model tests conducted for the Whiting Naval Air Station. One pipe outlet structure (C-4) is shown, the remainder of the film being devoted to methods of joining flow in open channel junctions where the velocities may be supercritical.

"Most of the figures for the pipe drop inlet spillway report were checked during the month and the photographs were prepared for reproduction. A new design chart for the SAF stilling basin was also checked."

Drainage Studies - M. H. Gallatin, Homestead, Florida.--"Showers occurred practically every day to May 19. A few of the gages show that showers occurred in isolated areas up to May 23. The following table gives the totals by station for the period:

<u>Location of Gage</u>	<u>May 1949</u>	<u>May 1948</u>	<u>May 1947</u>
Redland and Mowry	4.45	4.42	5.84
Sub-Tropical Station	3.43	4.11	5.95
Redland and Gossman	2.02	6.94	7.64
Plummer and Comfort	2.87	---	---
Peters Florida	7.61	4.94	4.94
Princeton Grove	6.47	4.12	6.60
Cooper Grove	5.96	4.42	9.97
W - Mowry	5.93	4.63	3.05
E-33, Highlands	3.16	6.83	3.31
Roberts and Avocado	3.75	3.37	5.12
Jeran Grove	5.16	---	---
Country Club & Waldin	4.23	---	---

"During the month rains of over 1 inch occurred on the 1, 4, 5, and 15th of May. Rains of over 2 inches were recorded at the W - Mowry gage on May 9 and a 3-inch rain was recorded at the Peters Gage on May 5.

"As a result of the daily showers during the early part of the month we had a constant rise in our water table until May 19. From that time to the end of the month the water table for the area fell rather rapidly due to the high dry winds.

"For the Redland Profile gains in our water table from May 2, to May 19 showed gains of 0.75 foot for the measuring point (at the north end of Gossman Drive) to 1.37 feet at well No. 4 which is toward the south end of this profile.

"For the period May 19 to May 31 the loss in our water table of 0.25 to 1.02 feet was recorded for the Redland profile. For the month the gain in elevation for this profile varied from 0.09 foot to 1.35 feet.

"For the Eureka profile from May 2 to May 19 gains in the water table varied from 0.53 to 1.80 feet. Losses for the period of May 19 to May 31 were 0.27 to 1.31 feet. Average gain for the period ranged from 0.33 to 0.76 foot.

"For the Mowry Street profile gains for the period May 2 to May 19 was from 0.77 to 1.85 feet and losses for May 19 to May 31 were 0.84 to 1.87 feet. Average gain in water table for the month varied from 0.08 to 0.7 foot.

"It will be noted that the greatest gain occurred in the lower south and southwestern part of the area.

"Readings of Well No. 5 corner of Mowry and Redland, show that on May 31, 1949, the water table was 1.85 feet M. S. L. On May 31, 1948, it was 2.29 feet M. S. L. and on May 31, 1947, the water table was 4.77 feet M. S. L.

"On the mulch plots readings to May 19 remained at or near the saturation point. From this date to the end of the period with high dry winds, moisture was rapidly depleted. On May 29 moisture had been so depleted that no reading could be made on the natural cover and check plots. Higher readings were recorded on the shavings, pine straw, and grass mulched plots than were recorded during the dry period of February and March.



"In connection with the moisture studies, during the first of the period the moisture blocks remained at or near the saturation point. On May 27 our readings showed that the citrus areas were at or near the wilting point. One of the lime groves was irrigated on May 27 and it was found that on May 30 moisture had been so depleted that the trees were again at the wilting point. This was due mainly to the fact that during the end of April and the first to the middle of May there was plenty of moisture. The trees put on a lot of new growth and as a result when rains stopped the moisture in the soil was rapidly depleted.

"With regard to the nitrate leaching studies, during the period in several areas the losses were high. This was due mainly to the practices followed by many of the growers, of using readily available forms of nitrogen during the dry portion of the year. On one grove two applications of low analysis material 30 percent organic, of which 15 percent was of a more inert material had to be applied, as after the first application we had over 2.5 inches of rain in 2 days."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"For May, 2.78 inches of rainfall was recorded at the Everglades Experiment Station and the evaporation from the standard pan was 7.056 inches. The mean maximum temperature was 88.0 degrees and the mean minimum temperature was 62.6 degrees.

"Several weeks ago it was found that on the slope course, established to ascertain the values of "n," located in the Davie area that there were many boulders of considerable size in the channel throughout the course. These were removed by re-dredging the channel with a dragline during the past month, and the slope course relocated about 150 feet south of the original course. Steel rods 5/8 inch in diameter were driven to rock 1,000 feet apart along the lateral, and the tops of each rod filed down to a shape suitable for measuring the distance to the water surface. This was measured by means of a hook gage and stilling well to an accuracy of 0.001 foot. Levels were run between each measuring point as accurately as possible reading the rod to the nearest 0.001 foot. Cross sections were located every 100 feet along the reach, and levels established at each 1 foot interval across the channel to obtain the hydraulic elements of the channel. These cross sections were plotted in the office on a scale of 1 inch = 2 feet and planimetered to obtain the weighted average of the cross sectional area of the entire slope course. Two foot-bridges were built across the channel, one at each end of the "course," and used for making current-meter measurements. Several days were spent making preliminary flow measurements and in developing techniques for obtaining maximum accuracy under conditions of very low velocities holding for this area. It was found that measurements made less than 0.4 foot above the bottom were not reliable due to bottom vegetative growth, even in the recently cleaned channel. It was determined from vertical integrations and many different measurements that the 0.2 and 0.8 depth method where the water is over 2 feet deep, and the 0.6 depth method where under 2 feet deep gave the greatest accuracy of all methods tested. Using these methods and obtaining the velocity at 2 feet intervals across the section it was found that a check of the flow at the upstream and downstream measuring stations varied less than 2 percent, and that a portion of this could probably be accounted for by seepage pickup along the 1,000 foot "course." For example, flow at the head of the reach was measured at 11.087 cfs and at the foot at 11.238 cfs. The average mean velocity was 0.195 foot per second.

"During the past month the State Legislature passed new laws of major importance for water control in south and central Florida. A bill was made into law establishing a new water-control district embracing about 17 counties in the State.



It will be the purpose of the new district to provide R/W and local contributions for the U. S. E. D. flood-control plan, and to maintain the works within the district when construction is completed. Ad valorem taxes up to 1 mill may be levied against properties in the district for funds. Next year tax levy is to be .3 mills to furnish money for establishment of the new setup. The law also provides for dissolving the present Everglades Drainage District over a period of several years when the bonded indebtedness is paid off, and for the absorption of the works and bonded indebtedness is paid off, and for the absorption of the works and property of the EDD into the new 17 county district upon dissolution of the EDD. It is reported that both boards are slated to work in close conjunction with each other during the life of the EDD and offices of the new board will likely be located at West Palm Beach."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.--"Mr. Walter Turner, Soil Scientist, reports that soil permeability laboratory determinations were made as follows:

<u>Site No.</u>	<u>Soil Type</u>
152	Tyler silty clay
153	Monongahela silt laom
154	August silt loam
155	Roanoke silt loam
156	Cecil fine sandy loam
157	Cecil very fine sandy loam
158	Lodi
159	Lodi
160	Atlee very fine sandy loam
161	Starr loam
162	Bladen loam
163	Bladen loam
164	Bladen silt loam

"During the month the Project Supervisor and the Drainage Engineer completed a paper summarizing the status of drainage research in the Southeast. This paper is to be presented at the Annual Meeting of the American Society of Agricultural Engineers at East Lansing, Mich."

Supplemental Irrigation Studies - J. Turnbull, Lake Alfred, Florida.--

"During May, additional measurements were made of the amount of new stem growth which has developed this year on the experimental irrigation plots at Lake Alfred. Citrus trees in Florida generally put out three flushes of growth a year. The first occurs in the spring as the trees respond to warm weather, the second occurs in June or July as the result of the starting of the rainy season, and the third occurs in the fall in response to the heavy rains which accompany tropical disturbances.

"The spring growth is highly dependent on the presence of sufficient soil moisture and a dry spring can greatly retard this growth as can be seen from table 1, on the next page. This spring was very dry until March 29 when a rain of 2.76 inches fell at the Lake Alfred plots. Irrigation was applied to selected areas on March 4 to 9. Growth measurements were made on April 6 to 13 and again on May 27 to June 2. Irrigated trees produced growth earlier and the growth

achieved greater length than did the growth on unirrigated trees. This greater bearing area may be one of the reasons for greater yields from irrigated trees. The Valencia oranges on the Lake Alfred plots were picked and the distribution of sizes, percentage of green fruit, and percentage of creased fruit were obtained by running the fruit through the packing house. The data on fruit sizes and fruit yields have not yet been analyzed but table 2 shows the percentage of green fruit found in samples from each plot, and table 3 shows the percentage of creased fruit found in samples from each plot. The data in table 2 are too variable to justify drawing any conclusions. The information in table 3 indicates no differences in the amount of creasing this year between irrigated and unirrigated plots."

Summary of Data from Lake Alfred Experimental Plots  
Blocks XVIII and XIX

Table 1

Average New Stem Growth in Inches

Variety	Irrigated plots		Unirrigated plots	
	April 6-13	May 27-June 2	April 6-13	May 27-June 2
Marsh Grapefruit	3.33	4.44	0.19	3.17
Duncan Grapefruit	2.80	3.68	.16	2.73
Hamlin Oranges	2.99	3.01	.51	2.37
Pineapple Oranges	3.37	3.20	1.09	2.67
Valencia Oranges	3.46	3.48	.91	2.57

Table 2

Percentage of Late Bloom and Regreened Fruit

Valencia Oranges

Irrigated plots		Unirrigated plots	
Plot 1	50.8	Plot 2	31.7
Plot 3	30.0	Plot 4	32.9
Plot 5	34.8	plot 6	19.0
Average	38.1	Average	27.7

Table 3

Summary of Creasing - Percentages

Valencia Oranges

Irrigated plots		Unirrigated plots	
Plot 1	2.82	Plot 2	3.61
Plot 3	4.55	Plot 4	2.79
Plot 5	3.68	Plot 6	4.87
Average	3.71	Average	3.81

## IRRIGATION DIVISION

Lining of Irrigation Canals and Ditches - C. W. Lauritzen reports "A number of permeability measurements were made on samples of material taken from the Logan-Northern Irrigation Company Canal bed as one phase of a study of seepage losses. Permeability was higher for the disturbed samples in every case than the permeability of the canal bed as determined with permeameters. In another test, seepage losses in a section of the Logan-Northern Canal were determined by the ponding method and by spot measurements with permeameters. The objective of these studies was two-fold:

1. To obtain information relative to the character of seepage losses from canals.
2. To evaluate the loss of water through seepage as a basis for determining whether lining would be justified.

"It is interesting to note that 3.2 acre feet of water was lost in 1800 feet of canal each 24 hours. If this water could be saved it would provide water sufficient to irrigate 80 acres of land. Assuming that the canal were to be lined with concrete at a cost of \$4 per square yard, the cost of such a water right per acre would be about \$200."

Consumptive Use Studies in Utah - Barrett reports "The Mechanical Equipment Research Laboratory is now in operation. Pomona Samplers, Parshall Flumes, Uhland Samplers, pressure plates and other research equipment are being made for the different field offices."

Management of Related Irrigation and Drainage Enterprises - Maughan reports: "In irrigated areas of Western States a need for drainage on low-lying lands is often caused by the irrigation of higher lands. The problem is complicated with reference to the responsibility of the higher lands to participate in the drainage costs accruing in the low-lying areas. This problem is well exemplified in the Cub River Irrigation Company Area situated across the Utah-Idaho boundary in Cache Valley. In a section northwest of Fairview, there has been an increase of irrigation on high-lying sandy soils in recent years. The area is above the Cub River Irrigation Company Canal and is served by another company.

"Following in the wake of this increase in irrigation a balance between irrigation and drainage below the Cub River Canal, established over a long period of years, was completely upset. The cause and the results are unmistakable. Below the Cub River Canal waterlogging is creeping upward towards the canal and farmers are now installing additional drains. Farmers below the Cub River Canal are adversely affected by the irrigation of farmers on higher lands above their canal.

"The problems of providing adequate drainage and equalizing the drainage costs are doubly difficult to deal with because the lower area in need of drainage and the upper area which needs none are served by different irrigation companies."



W. W. Donnan, Los Angeles, Calif.-Work was started on the investigation of irrigation efficiencies of truck crops in the San Fernando Valley. Soil samples have been taken on two different fields prior to the first spring irrigations. Additional soil sampling will be made before and after irrigation throughout the summer months. A series of irrigation efficiency studies on alfalfa being conducted by the Operations staff on some of their farm plans will be reviewed to augment the present information available.

Two days were spent in Imperial Valley with Frank Muceus and Orville Hosmer, Region 7 engineers, going over the drainage procedure used in Imperial Valley. These men spent the balance of the week in conference with Ace Bowen, District Conservationist and George Bradshaw, Research Irrigation Engineer, in order to become familiar with the techniques used in Imperial Valley to solve drainage problems. The following week these men met with John Sutton, Head Drainage Section, Washington, D. C. at which time the procedures, techniques and formula used to design drainage were demonstrated.

G. Marvin Litz, Los Angeles, California.-Preliminary to estimating monthly unit values per acre of the penetration of rainfall below the root zone for each of the major crops in the West Coast Basin, the period of 25 years preceding 1948, was chosen for study. The United States Weather Bureau stations at Long Beach and Santa Monica were selected as representative, and from their daily precipitation records a deduction for evaporation by storms was made. The two stations monthly average of the available rainfall for plant growth or deep percolation was tabulated for the period of record, September through April, for each hydrographic year of the period. Examination of the table shows that there is no relation between the monthly amounts of evaporation and precipitation and that the amount of evaporation can be determined only from the trend of how the precipitation actually occurred.

V. S. Aronovici, Pomona, California.-Soil moisture determinations were made of more than 100 samples subjected to 15 atmospheres pressure (wilting percentage). Soil moisture extraction rate curves at  $1/3$  atmosphere tension were made of an equally large number of samples for the purpose of establishing approximate field capacities.

Volume weights were calculated for 27 stations in the Beaumont-Yucaipa Basin and nine stations in the Los Angeles West Coast Basin. The basic data for these calculations were derived from previous observations made with the Pomona and Umland soil sampling equipment. These samples are only three inches in length and represent portions of the soil profile. Fall deficiencies are calculated on the basis of foot increments. Each soil profile horizon will have an independent volume weight and such horizons do not change on foot intervals. For this reason, it is necessary to plot each profile to scale, then plot the zones of measured volume weights. Then, it is possible to integrate the volume weights for each foot increment. The same process is necessary for establishing field capacities. Good field capacity estimates, based on field sampling for comparison with laboratory data, are rather poor again this year due to lack of sufficient rainfall.

Water Spreading for Storage Underground. - A. T. Mitchelson, Dean C. Muckel, Hayden K. Rouse, E. S. Bliss, Curtis E. Johnson.-Operation of the Buffer Pond Experiment, Replicate No. 2, has been continued throughout the month. During the first fifteen days, rates observed in the outer and inner ponds were very nearly the same fluctuating up and down together. On May 9, for the first time in the 25 days of operation, the rate in the inner pond was greater than that in the outer pond and continued at a higher rate for the rest of the month.

During the latter part of the month, the rate in the outer pond remained more or less constant while the rate in the inner pond showed such a marked increase that reasons for the change were sought. The possibility that a direct channel through a rodent burrow might have been opened was given consideration but no evidence was found in support.

During the final six days of the month, rates in both ponds dropped sharply bringing the rates in the inner pond to within 0.06 feet per day of the rate in the outer pond.

When the observations made on Replicate No. 2 are compared with those of Replicate No. 1 for the comparable initial run, the curves are entirely dissimilar.

At the end of May, 45 days after the start of the run, the rate in the inner pond is 1.79 feet per day while the rate in the outer pond is 1.73 feet per day. These rates compare with 1.22 and 0.67 feet per day on the 45th day of the first run of the original (Replicate No. 1) ponds.

As a result of Dr. McCalla's suggestions, several experiments are being designed and will be set up as additional laboratory space and equipment become available. At present, the deposit in the bottom of ponds is being investigated to determine the composition and microbial activity of this layer as compared to other portions of the soil and the pond water.

The water spreading program in San Joaquin Valley was reviewed with Dr. T. M. McCalla. The field ponds were examined in detail, and laboratory procedures and objectives were discussed with him and the Bakersfield staff.

On May 11th, a formal conference was held in the Kern County Land Company offices with all cooperators to report on the progress of the research studies and to discuss future plans. The laboratory and field studies outlined, received full approval from the cooperators. This meeting was called on rather short notice because of the wish to have Dr. McCalla present.

A report to cooperators on spreading of water for underground storage in San Joaquin Valley was completed during the month. The report has been edited by Mr. Ewing and is ready for mimeographing. Prints of figures have been ordered from Portland.

Report on "Spreading of Water in Clark County, Nevada, as a Means of Controlling Floods," was written and mimeographed during the month.



Performance Tests of Well Screens-R-3-2-1 No. 2 - Carl Rohwer.- Tests of the losses through punched screens with 1/8 and 1/16-inch perforations, without gravel envelopes and with 1-inch, 1/2-inch and 1/4-inch gravel envelopes were completed during May. These tests are being conducted by George Lesch with the assistance of Robert Butcher. Gilbert Corey spent the month analyzing the data and preparing a report on the work for his Master's Thesis. His analysis shows that the losses are independent of the size or area of perforations exceeds 20 percent of the area of the screen. However, it cannot be assumed that any screen with an adequate area of perforations will be suitable for a well because there are other important factors which must be taken into consideration.

Walter R. Meyer, Kansas.- During the first part of the month the ground was put in shape for planting beets. The first plots were planted on May 5. That evening we had a light rain about .38 and it was followed by 3 more showers, which made the total rainfall .98 inches for the 3 day period. The rest of the beets were planted on May 12th. There was plenty of moisture on each planting so we didn't have to irrigate them up. We had a very nice stand until May 20th when we got a .87 inch rain in 3/4 of an hour with some hail. Some of the plants looked pretty sick, but after a few days it looked as if we still had a good stand.

On May 23 we had a hard dashing rain of - 2.08 inches - in 3/4 of an hour, which also had some hail with it. This completely ruined the last planting of beets; however the older beets looked as if they might make it.

On May 28 it was determined that all beets would be broken out since we had anticipated comparing different water levels on two different plot layouts and the months difference in planting date would introduce too much of a variable.

The ground is being prepared and planting will start on June 1.

Moisture samples were taken before seeding and will be taken again at planting time.

The gated pipe was used for irrigating some of the rotation plots, and it was found with a 2-inch entrance head, we could discharge from 15 g.p.m. to about a half a gallon per minute from each gate. It really made a very easy method of applying water to the small plots.

Silt Studies-Dean W. Bloodgood.- Some progress was made during the month toward the completion of our annual progress silt report for the water year ending September 30, 1948. All of the silt data have been compiled for 22 stations. Two more remain to be completed - the Logansport station on the Sabine River and the Cotulla Station on the Nueces River. It is hoped the Surface Water Division, U.S.G.S., will be able to furnish us with river discharge for these stations soon so that we can complete and mimeograph the report before June 30.



During the month the Quality of Water Division, U. S. G. S., obtained a number of water samples at Colorado City Station, Colorado River, for silt determinations. These samples will be used in making a comparison between our Texas - U.S.D.A. sampler and a D-43 sampler in obtaining water samples for silt determinations. We will make silt determinations for the Texas - U.S.D.A. sampler at our cooperative silt laboratory. The Bureau of Reclamation is cooperating with the U. S. G. S. in making these studies and comparisons and has contributed \$2500 for this purpose for the one station. Our budget for 24 stations is approximately \$6000.

Sprinkler and Surface Methods of Irrigation Studies, W. D. Criddle, Idaho.- Large blocks of land in the Snake River plain of southwestern Idaho and eastern Oregon contain soils having extremely slow permeability rates. Part of this is because of slick spots on the lands and part because of a calcarious layer usually 18 inches to 24 inches down. Much of this land is under existing or proposed irrigation projects. In order to develop better irrigation practices for these lands, we are undertaking studies of irrigation by sprinkler and better methods of surface application to such lands. During the month of May considerable time was spent by Messrs. Davis and Pair gathering fundamental data on soil characteristics and the chemical and physical properties of the soils. Test plots were cleared of sagebrush and duplicate infiltration rates run on the undisturbed soil at twenty separate locations on the plots by the use of the double ring method.

The intake rate of these soils for the initial test period of 24 hours varied from an average of 2.9 to as low as 0.01 inches per hour. The land was then allowed to dry for 24 hours and the water held in the rings again for 48 hours. During this later period the intake rate varied from 2.9 inches per hour to practically 0. A number of samples were obtained for complete laboratory analysis to determine the chemical and physical properties of the soil. These analyses are being made through the cooperation of the Bureau of Reclamation Regional Soils Laboratory here at Boise.

A two day meeting was held in Nevada with State Conservationist Hardman, Clyde Houston and Harry F. Blaney, developing plans for consumptive use studies to be made in Nevada under Mr. Houston's direction during the next several years. This project is to be run in cooperation with the Nevada Agricultural Experiment Station, the Nevada State Engineer and possibly the U. S. Geological Survey.

Sites were chosen for the establishment of an evapo-transpiration station and for locations of evaporation stations, the results of which will be used in transferring consumptive use data from one area to another.

The cooperative consumptive use study in the Colorado River Area of Utah was given some attention during the month. This second year's operation of this study finds the need for some revision in our procedure and the obtaining of additional information, particularly on ground water conditions.

Some time was spent this month in revising the report entitled, "A Method of Estimating Water Requirements from Climatological Data," by Harry F. Blaney and Wayne D. Criddle. Additional information was obtained from various sources on the consumptive use coefficients for various areas. Also during the month the report prepared for the Engineering Advisory Committee to the Upper Colorado River Compact Commission entitled, "Consumptive Use of Water in the Irrigated Areas of the Upper Colorado River Basin," was revised and mimeographed for distribution to numerous individuals who have requested copies.

Emil Stuter, Texas.- Water application efficiencies were checked on the Experiment Station Farm during the month. This was the first irrigation for the cotton. The level and near level runs averaged 61 per cent efficiency of a 3.8 inch application. The graded plots with an average of 0.4 per cent grade indicated an efficiency of only 26 per cent from a 2.36 inch application. It is believed that the sampling technique was partially the cause for such low indicated efficiency.

In order that better samples might be obtained in future work, the improved soil tube was modified slightly. Subsequent work has proven the modification.

A piece of 12 gauge galvanized wire, approximately one inch long, was soldered onto the maximum diameter of the head of the improved tube and parallel to the axis of the tube. The wire was tapered on each end to eliminate an abrupt shoulder. The wire makes a small air slot in the side of the hole created by the soil tube. The slot permits air to get to the bottom of the hole thereby destroying the vacuum that would otherwise exist. As the tube is placed in the hole for successive depths, the wire is always placed in the small slot already created, thus widening and cleaning the air slot. In withdrawing the tube, it is rotated not more than one eighth ( $1/8$ ) of a turn and pulled straight up. This slight rotation opens the air slot. With this modification, cores can be recovered from wetter clays and more dry sands than previously. Cores recovered now average 10 to 11- $1/2$  inches in length where previously they averaged 6 to 9- $1/2$  inches. The tube is no more difficult to remove than the improved tube without the wire added.